

CE 521 Environmental Biotechnology - Fall 2006

Instructional Objectives

At the conclusion of the reading assignment and class lecture, you should be able to:

Introduction

1. Explain why environmental engineers should study biology
2. Describe what Leopold meant by the “hierarchy of responsibility”
3. Sketch out a concept map for relationships among information

The Cell

4. Describe Robert Hooke and Antonie van Leeuwenhoek’s contributions to microbiology
5. List the distinguishing characteristics of the two main groups of Protista.
6. Describe the composition and function of the cytoplasmic membrane, outer membrane, cell wall, and glycocalyx
7. Describe the various means of cell motility.
8. Describe the function of pili, storage products, gas vacuoles, and endospores.

Genetics

9. Define the structure and function of DNA, RNA, and plasmids.
10. Describe the processes of replication, transcription, and translation and name the three types of RNA.
11. Describe the four means of genetic recombinations among microorganisms.
12. Describe the process of genetic engineering and probe technology and provide examples for their use.

Microbial Groups

13. Give the distinguishing characteristics of bacteria, fungi, algae, protozoa, and viruses.
14. Give the approximate size, three basic shapes, and unusual types of bacteria.
15. Define the general classifications and structure of fungi, algae, and protozoa.
16. Describe the steps in virus replication, detection, enumeration, and classification and be able to estimate MPN from a serial dilution.

Microbial Metabolism and Growth

17. Describe the function and classes of enzymes.
18. State the Michaelis-Menten, Monod, Haldane, and Andrews equations, define the terms, discuss when it would be appropriate to use one equation over the other. Be able to calculate the Michaelis-Menten or Monod equation parameters from a linearization of the equation and explain why that may not be the best approach due to model error.
19. Describe the role of ATP in microbial metabolism and the three methods of ATP generation.
20. Describe the functions of catabolic and anabolic reactions in metabolism.
21. Outline the EMP (glycolysis) pathway and give the reactions where energy is produced
22. Describe the steps involved in the electron transport system and explain the mechanism for ATP production
23. Classify microorganisms on the basis of metabolism.
24. Provide a checklist of microbial growth requirements.

To be continued....